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ABSTRACT

As part of a cooperative extension service series by the University of Maryland this publication introduces the identification and control of common agricultural pests of fruit crops. The first of the five sections defines "pest" and "weed" and generally introduces different kinds of pests in the categories of insects, weeds, and diseases. Also in this section, pest control methods are introduced. The second section is a tabular listing of fruit crop plant diseases including information on "description and damage" and on "control and management practices." The third section is also a tabular listing of insect pests including "description and damage," "life cycle," and "control and management practices" information. The fourth section lists in the same format as the previous sections, the weeds that compete with fruit crops in Maryland. The final section is a collection of line drawings of some of these weeds. One is referred to other extension bulletins for specific chemical pest control methods. (MR)

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COOPERATIVE EXTENSION SERVICE • UNIVERSITY OF MARYLAND • COLLEGE PARK, MARYLAND

FRUIT CROP PESTS

MEP 312

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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WHAT IS A PEST?

Plants or animals that are directly detrimental to man or interfere with his goals and interests are commonly called pests. Included are plant and animal diseases, insects (plus mites, ticks and spiders), weeds and vertebrates (mice, some birds, some predatory mammals).

Certain pest organisms are competitors with man while others are simply nuisances or annoyances. A select number of predators, parasites and disease organisms are a serious threat to humans and domesticated animals. Many pests have an indirect influence, such as insects that carry infectious microorganisms. Others are harmful because they interfere with commodity production. They may do damage to a crop or destroy stored products and materials.

Farming practices often aid the establishment of pest species. The one-crop system of agriculture, where susceptible crops are grown and livestock are grazed on the same area continuously over the years, encourages the buildup of certain pests. The pest is provided with a good supply of host plants or animals and can multiply to harmful levels.

Man sometimes moves crops, along with their pest organisms, into new areas. Naurally occurring predators may not be found at this new location, and therefore, the pest is allowed to flourish. In other cases, the natural predators of the pest have been removed.

There are numerous pest species in competition with man, and so far, there are none which he has been able to eradicate completely. Man can only attempt to control these organisms and keep their damage to acceptable levels.

INSECTS

GENERAL

Arthropoda is the largest group in the animal kingdom and includes organisms such as lobsters, crabs, crayfish, millipedes, spiders, scorpions, mites and a special class called insects. This class contains butterflies, bees, ants, flies, aphids, and many more. By pure numbers, the *Arthropoda* are the dominant form of animal life on earth, with millions contained in almost every acre of land. Fortunately, only a small portion are serious pests to man's interests. Insects, as a class, are the most adaptable of all animals. They can be readily found living in the earth's extremes of heat, cold, drought and darkness.

Beneficial species pollinate ornamental flowers and many agricultural crops thus providing us with many of our fruits and vegetables. They work in many specialized areas such as the production of silk and honey, and they also serve as a food source for many higher animal forms.

Some insects pose a real threat to man, either directly or indirectly. The damage to crops, stored products, man-made structures, and the health of man and animals is sometimes tremendous. Many insects can be the vectors of livestock and human diseases while others damage man-made structures or eat foodstuffs. Still others are undesirable because they are a general nuisance to man in his day-to-day activities.

STRUCTURE

An adult insect's body is elongated and divided into three regions, the head, thorax and abdomen. The eyes and antennae are located on the head, and the legs and wings are connected to the middle region, the thorax. All adult insects have six jointed legs, and these are sometimes used for identification purposes since they can vary slightly between species. The adult may have no wings or be equipped with one or two pairs.

Wings and mouthparts are most important in identification. Some insect mouthparts are designed for chewing while others are adapted for piercing a food source and sucking out the nutrient material.

The insect's body is surrounded by a hardened material which not only protects the internal organs but also acts as the insect's skeleton (exoskeleton). Breathing is done through a series of tubes that travel from the body surface to the internal areas, allowing oxygen from the outside to travel directly to the tissues.

GROWTH AND DEVELOPMENT

As an insect matures, it grows in size and often changes form. The rigid shell that covers the body and protects the insect as an exoskeleton will expand only so far. This exoskeleton must be shed at intervals to allow for the growing process. This shedding or "molting" process can occur many times as the organism matures. Before the old shell is cast aside, a new one, which will allow for growth, is already being formed underneath the old.

Insects, between these successive molting processes, are called "instars", and with each molt, the insect will differ in size and form from the preceding instar. This changing process will continue until the adult form is reached. Almost all insects change in shape and size as they mature, and this development process is referred to as metamorphosis.

METAMORPHOSIS

All insects carry on these growth and molting processes, and the successive instars differ in form and size. Some insect species show little variation as they mature, changing only in size. Others undergo an extreme transition where the adult fails to resemble the young insect in any way. This is evidenced by the development of caterpillars into butterflies. Every species follows one of these developmental series of events or a process that falls somewhere between the two.

A small number of insect species develop without any gross changes whatsoever. As they develop, they change only in size. The adult insect lays eggs, and the newly hatched young look just like miniatures of the adult. As the young insects grow, they proceed through a series of molts, maintaining their basic appearance, but increasing in size. Some of these insect species that reach maturity without going through metamorphosis also add additional body segments as they mature. Common examples of these are the silverfish and springtails.

GRADUAL METAMORPHOSIS: Species that are characteristic of this type of development differ from the preceding process in that the eggs hatch into nymphs. The maturing insect (nymph) looks somewhat like the adult all through its development. The nymph is equipped with wing buds which will not fully develop into functional wings until the final molting stage. The mouthparts, legs and antennae are basically the same as the adults. Some nymphs live in water and breathe by gills until they mature. Examples of insects that develop by gradual metamorphosis are cockroaches, grasshoppers, crickets, stink bugs, lice and cicadas.

COMPLETE METAMORPHOSIS: Most of the insects mature by this last growth process. They do not make a gradual change from nymph to adult. The immature and mature forms differ so greatly that one would not believe them to be the same insect, and quite often they live in very different habitats.

Their development proceeds through four stages. A *larva* hatches from the *egg*. In this stage, the insects are referred to as caterpillars, grubs or maggots, and it is at this time that many insects do their greatest damage. The larva shows continued growth and molting and may proceed through several instars. The larva may or may not have legs, and the head may lack development. If the adult is to be winged, the wings will begin to develop internally. At the end of the larval stage, the organism slows its activity and forms a smooth, hard, protective, outer covering and enters into the *pupal* stage. The insect does not feed during this period and is usually inactive. The final molt occurs at the end of the pupal stage, and the *adult* form emerges. Shortly thereafter, colors develop, and the wings expand and harden. Many familiar insects follow this pattern such as maggots to flies, grubs to beetles and caterpillars to moths and butterflies. Other common groups with complete metamorphosis are fleas, wasps, hornets and bees.

Other arthropods can be pests too, such as mites, ticks, spiders, millipedes and scorpions. These insect relatives molt and have other characteristics like insects but none have a pupal stage, nor do any have wings.

WEEDS

When plants grow in undesirable areas, they are referred to as weeds. Common crop plants are considered weeds if they grow and compete in a field that has been seeded for a different crop. Weeds can reduce crop yields, increase production costs and reduce the quality of crop and livestock products. Some are poisonous or cause skin irritation while others are undesirable simply because they reduce the aesthetic value of landscaped areas. The many different weeds fall into four categories according to their life cycles.

SUMMER ANNUALS

Plants of this type have a one-year life cycle and result from seeds that sprout in the spring or summer. These plants mature, produce seed for the next generation and die in one growing season. The seed produced will lie dormant and then germinate during the following spring. Seeds not germinating at this point may do so at a later time when conditions are again favorable. Crabgrass, foxtail and pigweed are summer annuals.

WINTER ANNUALS

Members of this group have a one-year life cycle and grow from seeds that sprout in the fall. They mature, produce seed and die before summer. Their initial growth in early winter may be inconspicuous, but the growth rate increases toward the end of winter, and flowers and seed are produced. The seeds of most winter annuals are dormant during the spring and summer but germinate with the arrival of fall. Some species, whose life cycles are timed with fall-sown grains, produce mature seeds at the time the grain is harvested. The weed seed mixes with the grain, creating problems in marketing. Some representative winter annuals are henbit, field pepperweed, annual bluegrass and chickweed.

BIENNIALS

Biennials have a two-year cycle. When grown from seed, they develop a heavy root and a compact cluster of leaves close to the ground in the first growing season. During the following growing season, they mature, flower, produce seed and die. There are only a few species of biennial weeds, but they may appear anytime during the growing season. Bull thistle is one common biennial.

PERENNIALS

Plants which live more than two years or indefinitely are called perennials. They can grow from seed or from vegetative parts such as tubers, bulbs, rhizomes (root-like stems) or stolons (modified above-ground stems that bend down and take root). Their encroachment into new areas does not completely depend on seed production. Rhizome and stolon pieces can be transported in soil or by equipment. Seed dispersal is the major method of introduction into new areas, and once established, they rapidly spread, often forming patches. Quackgrass, dandelions, plantains and Johnsongrass are examples of perennial weeds.

DISEASES

Any condition that impairs the normal development or execution of normal life functions of a plant or animal is referred to as a disease. These situations are most often brought about by the presence of bacterial, viral, protozoan or fungal pathogens and parasites. Each year, tremendous economic losses can be attributed directly or indirectly to diseases of domestic animals, poultry and crops. Animal diseases reduce production rates and meat value, and some of these infections take on greater importance due to the fact that they can spread to man. Ornamental and crop plants alike are the targets of plant diseases which lower quality and yields. Severe cases of some of these plant diseases can result in complete crop failure.

FUNGI

The fungi are lower forms of plant life and are a very diverse group. They are familiar to us in everyday life as mushrooms, toadstools, molds, mildews, rusts, rots and smuts. They grow and thrive on almost any substance, including such things as water, food, leather, fabric, fibers, paper, glass, plants and animals. Ringworm, athlete's foot and histoplasmosis are just some of the fungal diseases that directly affect man.

Fungi are beneficial in many ways. Their ability to decay plant and animal materials makes them very valuable for maintaining soil fertility. Fungi are used in the manufacture of organic acids, and drugs and in the food industry to produce cheese. Also, some yeasts are used in brewing and baking processes.

Fungi are a lower plant form and lack chlorophyll, the green substance used by higher plants to manufacture their own food. They must live and grow on dead organic matter as saprophytes or on living organisms as parasites. The fungus may kill the host or live and obtain nutrients without causing death.

Of all the parasitic diseases of plants, those caused by fungi are, by far, the most frequently encountered. Almost every plant is subject to infection by at least one type of fungi. In severe cases, quickly spreading diseases can result in crop failure. The devastating Irish potato famine which began in 1845 and the mildew diseases that destroyed the French wine industry from the 1870s to 1880s are examples of the effects of these diseases in agriculture. Not all parasitic fungi have such devastating effects but a variety of them still present a real problem in agriculture and its related activities. A few of the fungal plant diseases that frequently must be dealt with are wheat rusts, potato blights, tomato blights, powdery mildews of rose, lilac, chrysanthemum and other ornamentals, Dutch elm disease, and chestnut blight.

The development of most fungal growths consists of structures which are vegetative or reproductive. In the vegetative stage, the fungus grows on or through the substratum, (the material on which the fungus lives), obtaining nutrient materials by secreting enzymes to break down the cell walls. This vegetative growth may be a single cell or many cells in long thread-like filaments (hyphae). In many cases these hyphae are very difficult to see. As they grow and interlace, they stretch out and attach themselves to new substrate material.

In the reproductive stage, the fungus has the ability to reproduce itself by spores or other means. Compared to vegetative structures, the reproductive structures are much more visible. They develop from the vegetative structures and they differ greatly in form, depending on the genus and species. The common "mushroom" is nothing more than the reproductive portion of a fungus.

Spore formation is the most common method of reproduction in fungi. These are small one-cell units that germinate and form a new plant and are produced in several ways. Millions of spores can be produced by a single fungus and because of this, the surrounding air is more or less filled with spores. These spores can then be disseminated by air currents, splashing rain, insects or other factors. These spores may even be dormant in the soil during periods of unfavorable weather and germinate at a later time.

The factors that play a role in the seriousness of any fungal infection are the number of infecting spores, temperature, humidity, cultural practices, soil moisture and control methods.

BACTERIA

Bacteria are microscopic, single-celled organisms which are so small that many thousands can fit into a drop of water. They can be found everywhere—in air, soil, fresh and salt water, and on plants and animals. Many bacteria benefit man's interests. Some of these organisms decay materials in the soil, making it fertile, while others produce nitrogen in a form useful to plants. Bacteria have been classified and divided into three common forms: rod shaped, oval or sphere shaped and spiral configuration. Most require air for their continued growth but there are some that prefer to exist in the complete absence of oxygen.

Except for a small number that can produce their own carbohydrate food, bacteria survive by obtaining nourishment from the organic materials of plants and animals. Of these, most will grow on decaying plant and animal material while some exist as parasites which attack the living cells of plants and animals.

In a favorable environment, bacterial organisms reproduce themselves readily by the process of cell division. This is achieved by the formation of a crosswall in the cell and two daughter cells result. As this process continues, filaments or colonies are formed. These cells can resist dry conditions and temperature extremes, and some form spores inside when conditions become too unfavorable. Long after the cell is destroyed and more favorable conditions exist, these spores can develop.

Bacteria surround us and when the parasitic forms come in contact with a plant or animal under the right conditions, an infection or disease may result. Ingestion, inhalation or exposure of open wounds are just a few of the ways in which they can attack an animal.

Bacterial plant pathogens can be spread in a number of ways—by wind, water and soil movements, cultural practices, insects or animals. An insect carrying bacteria may feed on a plant and thereby infect the plant. Some bacteria may enter through the water pores and air openings of the plant or simply through wounds. Some may attack the root system also.

Livestock are targets of bacterial diseases such as anthrax, blackleg, brucellosis and mastitis and fowl cholera infects poultry.

The parasitic (pathogenic) bacteria are the causal organism for a wide variety of plant diseases including many spot diseases, wilts, rots, galls and blights. Fire blight and crown gall of fruit trees, wildfire of tobacco, leaf spot of carnations, black twig blight of lilacs, bacteria blight and bacterial wilt of soybeans, fire blight of apples and pears and bacterial wilt of sweet corn are just a few of the plant pathogens.

It is important to remember that some of these destructive diseases are difficult to identify and the symptoms of vastly differing diseases may be similar. After careful study, if a question remains, the advice of an expert might be warranted.

VIRUSES

Viruses are extremely small disease-causing organisms, so small that one must use an electron microscope just to see them. Because of size, their presence is detected only by the symptoms they produce. A particular virus is usually very specific in the type of host in which it infects and multiplies. Also, it will limit itself to one type of tissue. Since the response in the host is usually so specific, viruses are named for the type of disease they produce (hog cholera — hog cholera virus). Viruses are capable of

attacking anything from bacteria to plants and animals. As a cause of much human suffering and considerable losses to the agricultural economy, these pathogens are undergoing intense investigation by scientists.

In crop economic losses, they stand only second to the fungi in importance. Cucumbers, tobacco, sugar beets, corn, fruits, potatoes, asters, elm and beans are just a few of the plants subject to virus infection.

Animal disorders such as foot-and-mouth disease of cattle, hog cholera, Newcastle disease of chickens and rabies and distemper of dogs are all virus caused infections.

Viruses reside in living hosts as opposed to some of the bacteria and fungi that live and grow on decaying material. They must have a living host in order to reproduce themselves and manage to take over control of a host cell and direct it to produce material to make new viral particles. The virus cannot make this material itself. In the process the host cell is destroyed.

Plant viruses are divided into two groups according to the kind of injury they produce. One group, the Mosaics, produce a mottling or a characteristic ring spotting of the leaves. Yellowish spots and blotches make up the disease areas. The second viral type are the yellows, causing dwarfing, leaf curl and yellowing. Mosaics and yellows are responsible for great economic loss in crops, the former taking the greater toll.

Pathogenic plant viruses are spread by a variety of methods. Propagation techniques involving infected seeds, bulbs, roots, tubers or cuttings can allow virus diseases to take hold. Transmission can also occur through the use of contaminated equipment to handle healthy plants. Insects that feed upon plants, such as aphids, mealybugs and leafhoppers, can carry the virus from plant to plant while they feed. Pollen, nematodes and fungi can also serve as vectors for virus.

NEMATODES

Nematodes (nemas) are roundworms of various sizes, some being parasitic for man and other animals, while others live on decaying material. The plant nematodes are very small, often microscopic, and are many times referred to as eelworms. Their life cycle includes an egg, four larval stages and an adult. Plant pathogenic nematodes live in soil and for the most part attack roots and other underground plant parts although above ground parts (leaves, stems, seeds) may be the target. As they feed their bodies become enlarged and rounded and swelling may occur in the attacked plant tissues.

Nemas may enter through air openings, water pores or by the wounds that result from mechanical injury. They may merely puncture the surface or enter completely and although the plant may not die, it is left in a weakened condition. As cells are destroyed or damaged, the plant is then left vulnerable to secondary infections by bacteria, fungi or viruses. Organisms of this type are responsible for economic losses in field crops (corn, alfalfa, soybeans, tobacco, etc.), vegetable crops (tomatoes, carrots, etc.), ornamentals and many turf varieties.

PLANT DISEASES

A plant disease may be described as any condition that interrupts the normal development of a plant by altering the appearance or function. Disease conditions may adversely affect the growth habit (stem, branches, roots), leaf shape and size, flowering and fruiting characteristics and all internal plant processes.

The causes of plant disease can be separated into two basic groups, the parasitic and the nonparasitic forms. The nonparasitic ones are classified together because they are all brought about by some unfavorable growth condition for the plant. Typical of the undesirable conditions are deficiencies or excesses in water or nutrient material, improper light, temperature extremes, mechanical injury and undesirable chemicals in the air and soil. Included in the parasitic group are those diseases caused by bacteria, fungi, nematodes (nemas) and viruses.

These parasitic organisms can be found on the interior or exterior of the plant, and the severity of infection will depend on the virulence of the disease and the plant's resistance. In most cases certain temperature and moisture conditions are required for infection, so therefore, climate plays an important role. Some disease organisms flourish only during rainy periods just as others cannot survive the extremes of cold.

Disease organisms must be able to overwinter in order to be able to infect plants during more favorable conditions. To do this, they may form resistant spores, or they may overwinter inside the host plant. Some may find protection in the seeds of plants while others may survive the winter in the tissues of an insect vector. Whatever the system, the life cycles of these parasitic organisms are all different and may vary from the extremely simple to the very complex.

Parasitic plant diseases are given a general classification by the types of visible symptoms they produce. They can be referred to as leaf spots, wilts, smuts, cankers, blights, blotches, rots and mildews.

SPOT DISEASES:

The spot diseases are recognized as a mark or blotch of discoloration found on the foliage or stem of the infected plant. They can be caused by numerous types of fungi and the accompanying environmental conditions. Each spot disease has a characteristic color and many are arranged in concentric rings. Each has a typical size and shape and in some cases, the disease affected area may also fall out forming a hole in the leaf. Certain insects may cause spotting of leaves.

WILT DISEASES:

Wilt conditions can be caused by a number of agents. Wilting may be due to a water deficiency or because of pathogens such as bacteria and fungi. In most cases there has been a blockage of the water conducting system of the plant due to disease or mechanical injury.

DAMPING-OFF:

Any of several fungi can cause this rotting of seedlings and cuttings. Seedlings may be attacked after germination but before they break through the soil. Postemergence attack can also occur, resulting in the killing of roots and stems at the soil surface. As cells are destroyed the plant weakens and falls over.

SMUTS:

These diseases are called smuts because of the sooty-black masses of spores that they produce. The target of the infections are usually the heads of corn and other cereal crops. The cause of the diseases are the true smuts fungi of the order Ustilaginales. The powdery masses break into dust-like powder when disturbed and the spores are then dispersed by the wind. Many of the fungi enter the host plant at an early stage of the plant's development and grow with it until the plant reaches maturity.

RUSTS:

Although this name is commonly applied to many ailments resulting in reddish-brown spotting or color change in plants, it is most accurately used to describe infections caused by fungi of the family Uredinales. They must reside on living plants and grow internally. The fungus penetrates cells and then removes the cell's nourishment.

ROTS:

Any large-scale decay of living plant material by an organism may cause rot. The name "rot" is used to describe many conditions which are caused by bacterial or fungal infestations.

BLIGHTS:

This is a commonly used term describing diseases occurring because of attacks of bacterial, fungal or viral parasites. Undesirable climatic conditions are also a contributing factor. The target area is usually the young growth of a plant, and the end result is withering and general death of stems, leaves and flowers.

BLOTCHES:

General terminology such as this is used to describe diseases that arise from any of a number of plant pathogens. Usually, it is referring to the appearance of the diseased area. A plant with a blotch disease has infected areas that are irregular in size and shape, which separates them from the spot diseases.

CANKERS:

An area of diseased woody tissue is often described in this way. Infestation by any parasite or damage by other factors results in the shrinking and cracking of tissues, leaving an open wound.

MILDEW DISEASES:

Plant pathogens of this type are evidenced by fungal growth that form on the surface areas of a plant, such as the leaves and stems. It may appear white, gray, downy or powdery, giving rise to such names as "downy mildew" or "powdery mildew". The severity of tissue infection is dependent upon the type of fungal organism.

MOSAIC DISEASES:

Many virus diseases are given this name because of the mosaic-like appearance of diseased leaves of the host plant. The leaves are mottled with light and dark areas and may show wilting and curling.

PEST CONTROLS

Man can encounter a wide variety of pest problems associated with his daily activities and interests. Whether they be diseases or unwanted plants and animals, the success of the control measures will depend on the use of a logical approach to the problem. The pest must first be identified. Knowing the characteristics of the pest organism and the crop or animal being threatened results in the choice of good control and management practices. The available control methods, including their risks and benefits, must be considered. The methods must be chosen that will be most effective and cause the least harm to the environment.

With most pest problems a condition arises, symptoms are analyzed, and then some type of corrective action is taken. However, not all pest problems can be attacked by this method. The approach to plant disease problems is one that differs in that the control is based primarily on prevention of the disease condition. In many cases, once the plant disease is recognized, it is too late for proper treatment.

There are control procedures available for treating pest problems and the degree of effectiveness depends on the type of problem and the severity. The following are the most important control methods.

NATURAL CONTROLS

A natural control is any ordinary condition in nature that slows down the reproduction and growth rates of pest species. Weather factors, such as moisture and temperature, are major control forces of insect and plant disease problems. Predatory and parasitic insects and some birds destroy many insect pests. Virus, fungus and bacteria diseases also take their toll among insects.

BIOLOGICAL CONTROLS

Biological controls involve man's use of natural predators, parasites, diseases and breeding techniques to reduce the numbers and economic impact of pest species. By releasing natural enemies, man can help control the pest. Aphid-parasitizing insects, one fungus antagonistic to another, and nematode-trapping fungi are all examples of biological controls.

Varieties of plants, which strongly resist disease and insect pests, have also been developed by man.

Another technique being used is the release of sterile male insects, causing interference in normal insect reproductive behavior.

PHYSICAL AND MECHANICAL CONTROLS

Physical controls are sometimes the most effective measures and include anything from fly swatters to ultra-high frequency sound production for killing pests. The use of radiation, distress and mating calls, repellents such as reflective "mulches", steam soil sterilization, and the various light, bait and sticky traps are all physical control methods. Other methods are electric shock grids, barriers, filters and fences for pest control. Habitat manipulation may involve flooding, drainage and nesting site destruction. Basic control measures for weeds are cultivation and the cutting of top growth to reduce weed vigor.

CULTURAL CONTROLS

Planting, growing, harvesting and tilling practices are all part of the cultural control of pests. Additional cultural control practices are crop rotation, construction methods, timing of planting and proper fertilization. With a knowledge of the pest, one can combine cultural controls with physical and mechanical practices to disrupt the normal association between a pest and its host.

Crop rotation can prevent the buildup of a pest population that favors one kind of plant. Some plant pathogens are unable to survive when a certain host is not present. Planting an alternative crop on which the parasite cannot exist will reduce parasite numbers after a time. The vulnerable crop can then be grown again.

Proper cultural practices, such as correct fertilization, will prevent certain diseases by producing vigorous plants. The removal of diseased plants and plant parts is very helpful in controlling diseases. Planting, tilling and cutting sequences are also a factor. The planting of crops in early spring before germination of weed seed will help avoid summer-annual weed problems. Insect pests can sometimes be controlled by carefully timed plowing which destroys a certain insect life stage.

CHEMICAL CONTROLS

Chemicals are used in a number of ways to control pest populations. They may be used to kill pests or they may act indirectly in the control method as repellents, attractants, sex stimulants, hormones or plant-growth regulators. The primary advantage of chemicals is speed in controlling pest problems, but in many cases their value is in protecting the host from possible disease infestations.

Pesticides and their related products come in many formulations. Most common are the emulsifiable concentrates, wettable powders, granules, aerosols (smokes, fogs, steam, vapors, etc.) baits (lures), dusts and impregnated materials.

Chemical control materials can be absorbed by pests in many ways. With contact absorption, the pest organism is adversely affected when it touches the pesticide. Plants can absorb herbicides through foliar (leaf) or root absorption. In the case of animal pests, some chemicals must be ingested before they take effect.

Some pesticides are referred to as systemics because they must be taken up and retained by the host. They render the potential plant or animal host toxic to pests feeding on it. The systemic may inactivate disease-produced toxins or directly attack the pest organism.

Certain chemicals act as pest repellents while others act as inhibitors of normal plant activity. Some weeds are controlled by photosynthetic-inhibiting herbicides which reduce weed vigor. Preemergence herbicides kill weed seedlings before or soon after they break the surface.

Other materials are referred to as chemical attractants and are used to lure insect pests to areas where they can be killed. These "pheromones" can be of an assembly-aggregation type or a sex attractant-sex stimulant type.

INTEGRATED CONTROLS

Often a combination of control methods is needed to achieve the desired effect. Combinations of bio-cultural controls, bio-physical controls and cultural-physical controls are very common.

When pests threaten, there are three basic approaches available to meet the problem.

PREVENTION: Steps can be taken to avoid infestations. Inspections and quarantines will help keep pests from infesting new areas. Clean conditions, cultural controls, treated seed, resistant varieties and pesticides all help to prevent problems.

SUPPRESSION: Once pest infestations have occurred, steps must be taken to reduce their numbers to acceptable levels. Chemical, cultural, physical and biological controls all help reduce the pest populations to keep damage to a minimum.

ERADICATION: In some cases, it is necessary to press control procedures even further to include the complete destruction of a pest in an animal or a crop area. Removal or destruction of diseased parts, or sterilization and fumigation of soil are examples of this total approach.

FRUIT CROP DISEASE PESTS

PLANT - DISEASE INDEX

APPLE *(Malus)*
- Bitter rot
- Black rot
- Blue mold
- Botryosphaeria rot and canker
- Fire blight
- Powdery mildew
- Rust
- Scab
- Sooty blotch

GRAPE *(Vitis)*
- Black rot
- Downy mildew
- Powdery mildew

HAWTHORN *(Crataegus)*
- Rust

PEACH *(Prunus)*
- Bacterial spot
- Brown rot
- Leaf curl
- Powdery mildew
- Scab

PEAR *(Pyrus)*
- Fire or pear blight
- Leaf spot

STRAWBERRY *(Fragaria)*
- Botrytis rot
- Leaf blight
- Leaf scorch
- Leaf spot
- Red stele
- Verticillium wilt

DISEASE	DESCRIPTION AND DAMAGE	CONTROL AND MANAGEMENT PRACTICES
BACTERIAL SPOT *(Xanthomonas pruni)*	Peach, Plum, Nectarine Numerous angular spots on leaf tips or along vein which drop out leaving holes. Leaves yellow and drop prematurely. Fruit spots turn to cracked or deep depressions. Gum drops form.	See Extension Bulletin 134. Plant resistant varieties.
BITTER ROT *(Glomerella cingulata)*	Apple Light brown circular spots which enlarge. Lesions become concave with pink spore masses. Fruit mummifies.	Prune out dead and weak limbs. See Extension Bulletin 134 for spray recommendations.
BLACK ROT *(Physalospora obtusa)*	Apple Fruit spots start as small brown to red spots, then turn dark and black. Fruit shrivels and mummifies. Brown circular leaf spots (frog-eye) appear on foliage.	Prune dead branches. See Extension Bulletin 134 for spray recommendations.
(Guignardia bidwellii)	Grape All vine parts attacked. On leaves, reddish-brown spots develop with black pycnidia. Rot starts on green fruit which turns black and mummifies.	See Extension Bulletin 242 for spray recommendations.
BLUE MOLD *(Penicillium expansum)*	Apple Rot starts at wounds causing loss in storage. Tissues are light brown, soft and watery with a distinct moldy taste and odor.	Use care in harvesting and handling. Keep storage temperature low.
BOTRYOSPHAERIA ROT and CANKER *(Botryosphaeria ribis)*	Apple Rot appears as small circular brown areas. Infections progress rapidly into center of fruit. Rotted tissue is soft. Apple trees have watery blisters on bark.	Prune trees to healthy limbs. See Extension Bulletin 134 for spray recommendations.

DISEASE	DESCRIPTION AND DAMAGE	CONTROL AND MANAGEMENT PRACTICES
BOTRYTIS ROT (Gray mold) *(Botrytiscinerea)*	Strawberry Infection often starts on blossoms and green fruit after frost damage. When berry touches the ground, rot may start. Starts as brown, soft spot. Rot spreads. The berry becomes firm and dry. A gray mold is present.	Proper spacing of plants is important. Apply fertilizer in fall — not in spring. See Extension Bulletin 242 for spray recommendations.
BROWN ROT *(Monilinia fructicola)*	Peach, Plum, Cherry Flowers turn brown early. Rot in moist weather. Rot on ripening fruit starts as small circular brown spot and spreads rapidly to cause decay of entire fruit.	Remove peach mummies when pruning. Remove rotted peaches or cultivate in spring. See Extension Bulletin 134.
DOWNY MILDEW *(Plasmopara viticola)*	Grape Pale yellow spots appear on upper leaf surfaces. White mildew may be found on lower surfaces. Young canes, leaf petals and tendrils may be infected. Young fruits stop growing, turn dark and dry.	For controls, see Extension Bulletin 242.
FIRE BLIGHT *(Erwinia amylovora)*	Pear, Apple Blossoms and leaves of infected twigs suddenly wilt, turn brown or black and die. Blighted twigs carry persistent leaves. Cankers are sunken areas with definite margins. Fruit rot is watersoaked, then darkens and becomes soft. A collar rot may develop where cankers are near base of tree.	Do not plant susceptible pear cultivars. See Extension Bulletin 134.
LEAF BLIGHT *(Dendrophoma obscurans)*	Strawberry Lesions are large, angular and reddish purple with a brown center. Spots may be a V-shaped area near edge of leaf. May be serious after harvest.	Mowing old beds after harvest reduces damage.

DISEASE	DESCRIPTION AND DAMAGE	CONTROL AND MANAGEMENT PRACTICES
LEAF CURL *(Taphrinia deformans)*	Peach Leaves are curled, puckered and distorted, greatly increased in thickness. Leaves drop. Young fruit may be infected.	See Extension Bulletin 134 for spray recommendations.
LEAF SCORCH *(Diplocarpon earliana)*	Strawberry Dark purplish spots are plentiful over upper leaf surface. Lesions also on petioles, stolons and fruit stalks. Leaf spots enlarge to scorch wide areas of the leaf.	See Extension Bulletin 242.
LEAF SPOT *(Mycosphaerella fragariae)*	Strawberry Leaf spots at first purple, then reddish with light brown or white centers. Loss of leaf surface causes reduced yield and weak runner plants.	See Extension Bulletin 242 for control.
(Fabraea maculata) *(Fabraea thuemenii)*	Pear, Hawthorn, Quince Small purple spots appear on leaves, later turning to a brownish circular lesion. Extensive defoliation may result. Fruit spots are black and slightly sunken.	See Extension Bulletin 134.
POWDERY MILDEW *(Podosphaera leucotricha)*	Apple Leaves, twigs, blossoms and fruits may be stunted, deformed or killed. White patches are formed on leaves which are folded and soon become brittle and dry. Fruit on cultivar Jonathan may be russeted.	Resistant varieties should be planted. See Extension Bulletin 134.
(Sphaerotheca pennosa)	Peach White spots on immature fruit, which later turn brown.	See Extension Bulletin 134 for spray schedule.
(Uncinula necator)	Grape Leaves are covered with white patches usually in late summer. Spots may turn brown. Leaves may desiceate.	See Extension Bulletin 242.

DISEASE	DESCRIPTION AND DAMAGE	CONTROL AND MANAGEMENT PRACTICES
RED STELE *(Phytophthora fragariae)*	Strawberry Soil fungus attacks roots, destroying fine feeder roots. Central root core or stele is red. Leaves are small, bluish and may dry up. Plants die.	Plant only resistant varieties. Purchase certified plants. Do not replant in fields.
RUST *(Gymnosporangium juniperi-virginianae)*	Apple Yellow spots are on upper leaf surface. Spore cups are formed on lower surface. Premature defoliation may result. Galls, brown and kidney shaped, are formed on red cedar. Orange-yellow telial "horns" appear in wet spring.	Plant resistant varieties. Remove red cedar within 1 mile of apple orchard.
(Gymnosporangium globosum)	Hawthorn Cedar galls similar to cedar-apple rust. Leaf spots on apple and hawthorn. No infection on apple fruit.	Plant resistant varieties. Remove red cedar within 1 mile of apple orchard.
SCAB *(Venturia inaequalis)*	Apple Smoky to olive-drab moldy spots on apple leaves, calyx, sepals and petioles. Fruit spots at first are dark, circular areas. Later, older spots may turn tan and corky. Leaves and fruit may drop.	See Extension Bulletin 134 for spray schedule.
(Cladosporium carpophilum)	Peach Small, round, black spots appear on fruit. May be on upper side of fruit near limb and cracking often follows. Lesions also develop on twigs where pathogen overwinter.	See Extension Bulletin 134 for spray schedule.

DISEASE	DESCRIPTION AND DAMAGE	CONTROL AND MANAGEMENT PRACTICES
SOOTY BLOTCH *(Gloeodes pomigena)*	Apple Blotch develops on apple fruit. Spots may coalesce to cover the surface. Wet or humid weather favorable for infection.	See Extension Bulletin 134.
VERTICILLIUM WILT *(Verticillium albo-atrum)*	Strawberry Outer leaves wilt and dry. Few new leaves develop. Plants appear wilted and flattened and may collapse. Less severely affected plants are unproductive. Disease will often appear in mother plants but not in rooted daughter plants.	Plant only resistant cultivars. Do not plant within 3 years between tomatoes, peppers or potatoes.

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FRUIT CROP INSECT PESTS

PLANT - INSECT INDEX

APPLE *(Malus)*
- Aphids
- Apple maggot
- Codling moth
- Mites
- Plum curculio
- Redbanded leafroller
- San Jose scale

GRAPE *(Vitis)*
- Grape berry moth
- Grape flea beetle
- Grape phylloxera
- Japanese beetle

PEACH *(Prunus)*
- Catfacing insects
- Japanese beetle
- Oriental fruit moth
- Peachtree borer
- Plum curculio

PEAR *(Pyrus)*
- Codling moth
- Pear psylla

STRAWBERRY *(Fragaria)*
- Aphids
- Cutworms
- Meadow spittlebug
- Sap beetles
- Spider mites
- Strawberry leafroller
- Strawberry root weevil
- Strawberry weevil

FRUIT CROP INSECT PESTS

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
APHIDS *(Aphididae)* Apple Apple grain Rosy	Apple Rosy aphid is the primary pest. It is purple or rosy in color when nearing maturity. Nymphs look like adults but lack wings. Apple aphid and apple grain aphid are green in color. Eggs of all 3 are black and look alike.	The aphids overwinter in the egg stage. They hatch in early spring. The rosy aphid nymphs and adults cause curling of leaf clusters and stunted deformed fruit. They migrate to cover crops in summer and return to trees in fall for egg laying. Apple and apple-grain aphids cause little or no damage to trees.	See Extension Bulletin 134 for spray recommendations.
(Aphididea spp.)	Strawberry Small, yellow, pale green or gray soft-bodied insects. Feed on undersides of leaves causing plants to yellow and become stunted. Leaves may be covered with a sticky substance called honeydew. One species feeds on roots.	Overwinter as eggs or wingless females. Females can give birth to live young. Many generations produced during a season. Most numerous in spring and fall; almost disappear in hot, dry summer.	Aphids must be controlled on strawberries since they can transmit the organisms that cause serious plant diseases. For spray schedules, see Extension Bulletins 236, 242 and 125.
APPLE MAGGOT *(Rhagoletis pomonella)*	Apple Adult flies are black with white bands on the abdomen, 4 on the female, 3 on the male. The larva is a yellowish, legless maggot about ¼ inch long. Infested fruit may be hollowed out with little or no external evidence of damage.	The maggot overwinters in a puparium 1 to 6 inches deep in the ground. The flies emerge in midsummer. Eggs are deposited in punctures in the apple skin. The eggs hatch in 5 to 10 days. Maggots entering fruit develop slowly until fruit drops. They leave fruit to pupate in ground. May remain in puparium a year or two before emerging.	See Extension Bulletin 134 for control. More of a problem in home fruit than in commercial orchards. For home fruit, see Extension Bulletin 125. Pick up and destroy fruit on ground.

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
CATFACING INSECTS *(Lygus lineolaris)*	Peach Tarnished plant bug is the primary catfacing insect although other plant bugs can cause damage. Adult bug is ¼ inch long and ⅛ inch wide, coppery brown, flecked with darker brown and yellow. It has a sharp beak for piercing and sucking.	Insects overwinter as adults, flying to trees in the spring. Nymphs look like the adults but have no wings. They inject a substance when feeding which is injurious to plant tissue. This tissue does not develop, causing deep sunken areas in the peach.	See Extension Bulletin 134. Sprays must be applied in pink and petal fall.
CODLING MOTH *(Laspeyresia pomonella)*	Apple Moth grayish with chocolate brown patches on tip of front wings and faint wavy crossbands of brown on rest of wings. Wing span ½ to ¾ inch. Larva is pinkish white with brown head and about ¾ inch long found inside apple.	Overwinters as a full-grown larva in cocoons under bark on apple tree trunk. Transforms to brown pupa in spring; moths emerge in early May. Mating and egg laying take place at dusk when temperatures are above 55°F. Eggs are deposited on leaves. Hatching larva enters nearby fruit, burrowing to core. These fruit may drop. Larva leave fruit to pupate. There are 2 generations and a partial third in Maryland.	See Extension Bulletin 134 for control.
	Pear (See CODLING MOTH — Apple)		Follow apple schedule in Extension Bulletin 134.
CUTWORMS *(Noctuidae spp.)*	Strawberry Larvae or caterpillars are fat, dull gray to black; up to 1¼ inches long. Some may be brown or spotted. Adults are moths and fly at night. Cutworms cut off plants at ground level or make holes in leaves.	Cutworms cut off plants and feed mostly at night. Hide during day under leaves. Overwinter as larvae under trash or plant debris; resume feeding in spring. Transform to moths during late spring or summer. One to several generations produced depending upon species.	Apply sprays, dusts or baits just before dark. See Extension Bulletins 236, 242 and 125.

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
GRAPE BERRY MOTH *(Paralobesia viteana)*	Grape Adult is a grayish-purple moth with a ½ inch wingspan. Larva is ⅓ to ½ inch, greenish-gray with a brown head. Found in webs on fruit clusters. Pupa in cocoon under folded leaf. Eggs are cream colored, found on grapes, stems or flower clusters. Cause grapes to turn dark purple and drop.	Overwinter as pupae in cocoon. Moths emerge in late spring about grape bloom. Eggs are deposited at dusk. Takes 5 weeks for a generation.	See Extension Bulletin 242 for spray recommendations.
GRAPE FLEA BEETLE *(Altica chalybea)*	Grape Beetle is ⅕ inch long and has a dark, metallic, greenish-blue color. Larva is light brown, black spotted and ⅓ inch long. Both feed on buds and grape leaves. Most of the damage is done by spring generation.	Overwinter as adults in vineyard and become active in spring. Deposit light yellow eggs in masses on canes or upper surface of leaves. Mature grub drops to ground to change to beetle stage. Two generations per year.	See Extension Bulletin 242 for spray recommendations.
GRAPE PHYLLOXERA *(Phylloxera vitifoliae)*	Grape An aphid which causes galls on grape leaves. To date, the root infesting form has not been observed in Maryland.	Aphids overwinter as eggs attached to the canes. In spring, the eggs hatch and young nymphs feed on grape leaves causing galls to be formed. Adults give birth to living young until fall, when males appear and mating and egg laying occur.	See Extension Bulletin 242 for spray recommendations.

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
JAPANESE BEETLE *(Popillia japonica)*	Peach Adult beetle is metallic green or greenish-bronze, 1/3 to 5/8 inch long with reddish wings. Two prominent and several smaller white spots on tip and sides of abdomen. The grub is 1/2 to 3/4 inch long, resembling white grub and is found in soil. Adults feed on both foliage and ripening fruit. Grape (See JAPANESE BEETLE—Peach)	Grubs overwinter in the soil and growth is completed during June. Adults emerge in July and are abundant during July and August. Eggs are deposited in the soil where the grubs feed on grass roots. One generation per year, but grubs can take up to 2 years to develop.	See Extension Bulletin 134 for commercial spray recommendations. Homeowners, see Extension Bulletin 125.
MEADOW SPITTLEBUG *(Philaenus spumarius)*	Strawberry Nymphs or young produce a frothy material that completely covers their bodies. While in this frothy material they suck sap from stems and leaves. Infested plants wilt and lose color. Adults are brown to black jumping insects, about 1/4 inch long.	Spittlebugs overwinter in the egg stage; eggs are laid in stems of strawberry and other plants. In the spring, nymphs or young appear. Adults common during summer and fall. One generation per year. Most abundant in central and western Maryland.	For control, see Extension Bulletins 236, 242, and 125.
MITES European red *(Panonychus ulmi)* Two-spotted *(Tetranychus urticae)*	Apple European red mite is the major mite pest. Adult is bright to brownish red, and unspotted in color. The eggs are also red. Two-spotted mites are yellow to orange in color with two dark spots on the back. The eggs are white in color. These mites cause bronzing of foliage and cause a reduction in fruit size. If damage occurs before June, fruit set for the following years crop will be reduced.	European red mites overwinter as eggs on twigs of apple trees. These eggs hatch about bloom time, and nymphs feed on foliage. Two-spotted mites overwinter as adults in trash on the orchard floor and migrate to the trees in spring and summer. Average length of life cycle is about 21 days, with 4 to 8 generations per year.	See Extension Bulletin 134 for spray recommendations.

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
MITES (Cont.) Spider *(Tetranychus spp.)*	Strawberry Tiny, 8-legged creatures; barely visible to the naked eye. Color ranges from pale greenish yellow to deep red. Dark spots may be present on back. Feed on undersides of leaves, sucking out plant juices. Leaves lose color; plants become wilted and stunted. Mites also infest berry caps. Yields greatly reduced.	Overwinter as adults, eggs, and young on strawberry plants or weeds in or near fields. During warm weather a generation can be produced in from 10 days to 2 weeks. Spider mite populations are favored by hot dry weather.	For spray schedules, see Extension Bulletins 236, 242, and 125.
ORIENTAL FRUIT MOTH *(Grapholitha molesta)*	Peach Moth is gray with chocolate brown markings on wings, resembling the codling moth and has a wingspan of ½ inch. The first generation larvae infest the new growth twigs causing a dieback. The worm, if found, will be in the twig. Later generations enter and damage the fruit. Larva is ½ inch in length.	Insects overwinter as larvae under the bark or in orchard weeds and mummied fruit. In spring, they transform to the pupa with moth emerging in June. First generation infests twigs. Other generations enter fruit in the same manner as codling moth on apple. As many as 7 generations a year.	See Extension Bulletin 134 for spray recommendations.
PEACHTREE BORER *(Sanninoidea exitiosa)*	Peach Female moth is bluish black with clear hind wings and with an orange crossband on the abdomen. The male has several narrow, yellow crossbands on the abdomen and resembles a wasp. The larva is ⅛ to ½ inch in length. The difference in size is due to a long period of egg laying. This borer can cause death to peach trees, especially those only a few years old.	Insects overwinter as larvae in the bark of peach trees. They pupate in the latter part of May. Adults emerge in June through September. Eggs are deposited on bark of the peach tree.	See Extension Bulletin 134. Sprays must be applied June 15, July 15 and after harvest.

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INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
PEAR PSYLLA *(Psylla pyricola)*	Pear Adult is a dark, reddish brown, four-winged, cicada-like insect, 1/10 inch long. The nymphs are small, yellow and wingless. The eggs are pear shaped and orange-yellow. The insect sucks plant juices and excretes honeydew in which black fungus grows. Leaves turn brown and drop. Fruit drops prematurely.	Adult psylla overwinter under bark or other sheltered places in orchard. Adults emerge in spring and deposit eggs in cracks in bark or about buds. These eggs hatch about full bloom. The nymphs may be found on stems and undersides of leaves. Three to 5 generations per year.	Dormant oil in soaking application. CAUTION: Do not apply oil if temperature for the 24-hour period following application will drop below 40°F. See Extension Bulletin 134 for other controls.
PLUM CURCULIO *(Conotrachelus nenuphar)*	Apple Adult is a dark brown, snout beetle, ¼ inch long and has 4 humps on wing cover. Larvae is white, leg-less, curved-bodied with small brown head and about ⅓ inch long when full grown. Peach (See PLUM CURCULIO — Apple)	Adults overwinter in woods or orchards under leaves or stones. Enter fruit trees in spring to deposit eggs in crescent-shaped slits. Larvae enter fruit after eggs hatch. Infested apples fall to ground for completion of larval stage. Larvae in fruit remaining on tree fail to develop.	See Extension Bulletin 134 for control.
REDBANDED LEAFROLLER *(Argyrotaenia velutinana)*	Apple Adult moth has brownish front wings crossed by a reddish band. Wingspan is ⅝ inch. Larva is pale green with yellowish-green head and when full grown is ¾ inch long. Eggs are deposited in masses and are light yellow in color and waxy in appearance.	Overwinter as pupae in trash under fruit trees. Moths emerge at bud break in spring and deposit egg masses on large limbs and trunk of tree. Later generations deposit egg masses on foliage. Young larvae feed on leaves, webbing them together. Larvae feed externally on apples, cutting shallow irregular channels where leaves touch fruit. Three to 4 generations occur per year.	For recommended insecticide, see Extension Bulletin 134.

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
SAN JOSE SCALE *(Quadraspidiotus perniciosus)*	Apple Female scale cover is round, grayish with raised nipple spot at center and is ½ inch across. Male scale cover is grayish, oval in shape with raised dot near larger end of scale. Crawlers are small, yellow insects resembling mites; crawlers have 3 pairs of legs and 2 antennae.	Overwinter as full grown insects under scale cover on tree limbs. Females give birth to living young crawlers which are found on trees from first part of June to frost. Insects suck juice from twigs and fruit causing red spots to form on fruit. Cabium layer of limbs are red-streaked in heavy infestation.	Thorough soaking of trees with dormant oil. See Extension Bulletin 134 for additional spray recommendations.
SAP BEETLES *(Nitidulidae)*	Strawberry Adult beetles are black to brown; up to ¼ inch long. They are attracted to and feed on ripe fruit. The most common sap beetle on strawberries is very small and brown. Larvae are white and maggot-like; feed along with adults in ripening or decaying fruit.	Overwinter as adults in secluded places. Move to ripening or fermenting fruits later in season. Larvae usually have habits similar to those of adults. One to several generations per year.	No chemicals registered against this pest. Do not let ripened fruit remain in fields.
STRAWBERRY LEAFROLLER *(Ancylis comptana fragariae)*	Strawberry Larva or caterpillar is up to ½ inch long; color ranges from pale green to grayish brown. Feed on lower and upper leaves, often tying top surfaces together with webbing. Tied leaves become rolled and withered. Adults are small moths with red, brown and white markings.	Overwinter as larvae or pupae (resting stage) in old folded leaves. Larvae or caterpillars are most troublesome about picking-time and during late July and August. In Maryland there are two generations per year.	Parasites usually control this pest. If controls are required, see Extension Bulletins 236, 242 and 125.

INSECT	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
STRAWBERRY ROOT WEEVIL *(Brachyrhinus ovatus)*	Strawberry Black to brown oval beetles with a short snout or beak; about 1/5 inch long. Larvae are fat, legless, white grubs with tan heads. Grubs work on roots and in crown, causing stunted plants with leaves closely bunched together.	Overwinter as adults in or near strawberry fields. Adults emerge in spring and lay eggs in soil near plants. Eggs hatch, and larvae or grubs feed on roots. New adults appear during summer.	Soil treatments before plants are set are required to control root weevils. See Extension Bulletins 236, 242 and 125.
STRAWBERRY WEEVIL *(Anthonomus signatus)*	Strawberry Adults are very small, brown beetles with a long snout or beak; only 1/10 inch long. Larvae are grubs about 1/10 inch long and creamy white. Adults sever stems of fruit buds in spring, causing them to hang by part of the stem or fall to ground. Larvae feed and develop inside buds.	Adults overwinter in debris of woodlands near strawberry fields. In early spring, they move on to strawberry fields. Eggs are laid in buds and stems are girdled and cut. Larvae develop in buds and new adults emerge in early summer. By midsummer they move to hibernation sites.	For chemical control, see Extension Bulletins 236, 242, and 125.

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FRUIT CROP WEED PESTS

WEED	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
DANDELION *(Taraxacum officinale)*	Perennial herb with a thick taproot, often several feet deep, with many-branched crowns with a milky juice, reproducing by seeds and by new shoots from the root crowns. Stems are very short and wholly underground. Leaves are in a rosette at the ground surface, have toothed edges and lower leaves are sometimes 12 inches long. Flower heads are numerous and button shaped, about ½ inch in diameter.	Blooms in early spring, coinciding with apple bloom. Honey bees are attracted to dandelion bloom; thus, less bees are available to work the apple bloom. Otherwise, dandelion is of no particular concern in orchards.	Mowing will destroy many of the blossoms; cultivation is not practical. Herbicides can be used in early spring just ahead of blossom time; however, fall spraying is more practical, as dandelions become active when cooler temperature prevails. See Extension Bulletin 134 for spray recommendations.
DEWBERRY or BLACKBERRY *(Rubus spp.)*	There are many species of *Rubus* varying from blackberries to dewberries and raspberries. All are perennials with semiwoody canes. Canes are trailing or upright and arching, usually with thorns.	Each year, new canes come up. They fruit the following year and then die. There are new canes and fruiting canes present every year. Vegetative canes emerge in late spring, usually after herbicides have been applied.	Cultivation or application of approved herbicides in June after plants are fully leafed out. See Extension Bulletin 134 for spray recommendations.
HORSENETTLE, (SAND BRIER) *(Solanum carolinense)*	Perennial, prickly, reproducing by seeds and by underground roots. Stem is simple or branched, 1 to 4 feet tall. Leaves alternate, 3 to 5 inches long and about half as wide, margin divided into lobes and coarsely-toothed (2 to 5 teeth), rough, yellow prickles on petioles, midribs and veins. Flowers white or bluish, 5-lobed, about 1 inch across. Berries are yellow, juicy ⅜ to ⅝ inch in diameter and borne in clusters.	Roots may be up to 5 feet in depth. New growth emerges in late spring, after usual herbicides have been applied. Tends to become vigorous and more abundant when competition from grasses is eliminated or reduced.	Cultivation, or application of approved chemicals. Quick regrowth will occur from contact herbicides, although the top growth is fairly easy to kill. See Extension Bulletin 134 for spray recommendations.

WEED	DESCRIPTION AND DAMAGE	LIFE CYCLE	CONTROL AND MANAGEMENT PRACTICES
MILKWEED, (common) *(Asclepias syriaca)*	Perennial, reproducing by seed and from long spreading roots. Stems are stout and erect, 2 to 5 feet tall, covered with soft downy hairs, with milky juice. Leaves are opposite, oblong, rounded, 4 to 8 inches long with prominent veins. Upper surface is smooth and lower surfaces are covered with short white hairs. Flowers are sweet smelling; pink to white; in large many-flowered, ball-like clusters at the tips of the stems and in the axils of the upper leaves. Seed pod is grayish, hairy and covered with soft spiny projections.	Above-ground portion dies in fall. New plants emerge in late spring after usual herbicide application and becomes more abundant after other vegetation has been eliminated.	Cultivation, or application of approved herbicides after plants are fully leafed out but before seed pods are formed. See Extension Bulletin 134 for spray recommendations.
POISON IVY *(Rhus radicans)*	Perennial, woody shrub or vine, reproducing by seeds and by creeping rootstocks from the basal stem nodes. Stems are erect and shrubby or a vine climbing high into trees. Leaves consist of 3 large shiny leaflets each 2 to 4 inches long, pointed at tip. Leaf edges are smooth, or irregularly toothed. Berries are small, white, round and hard. All parts of the plant contain a poisonous material which may cause blistering of the skin.	Leaves drop in late fall and new ones begin tc grow about time of apple bloom. Grows vigorously under shade of trees, and if not controlled will produce a thick ground cover up to 2 feet high. Plants next to the trunk of a tree will climb far up into the tree, endangering fruit pickers.	Destroy plants when first established by cultivation or by approved chemicals. In heavy infestation, regrowth usually will occur to some extent. Prevent plant from climbing trees if possible; when this happens, pull climbing portion from trunks, preferably by someone not allergic to this plant. See Extension Bulletin 134 for spray recommendations.
VIRGINIA CREEPER *(Parthenocissus quinquefolia)*	Perennial vine, reproducing by seeds and running roots. Stems are woody and climb by means of tendrils. Leaves consist of 5 leaflets (compared with 3 in poison ivy); commonly found in association with and sometimes mistaken for poison ivy. Unlike poison ivy, does not contain poisonous substance and is not a hazard from this standpoint.	Loses leaves in fall and new leaves emerge in late spring. A fast climber, but more of a nuisance than damaging to fruit trees or people.	Cultivation, but once firmly established is hard to eliminate. Quite resistant to most available herbicides. Can be pulled away from the tree, or the stems on the tree trunk may be cut leaving climbing portion to disintegrate.

DANDELION

Drawing courtesy of Jim Converse and O. M. Scott and Sons

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Rubus allegheniensis Porter. Allegheny blackberry. *A*, Primocane habit—× 0.5; *B*, floricane habit —× 0.5; *C*, fruit showing drupelets—× 0.5; *D*, seeds—× 3.

DEWBERRY or BLACKBERRY

Drawing courtesy of Agricultural Research Service, U.S. Department of Agriculture.

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—*Solanum carolinense* L. Horsenettle. *A*, Habit—× 0.5; *B*, flower—× 1.5; *C*, berries—× 0.5; *D*, seeds—× 5.

Asclepias syriaca L. Common milkweed. *A*, Habit—× 0.5; *B*, flower, upper view—× 3.5: side view—× 2; *C*, follicles—× 0.5; *D*, seeds with coma—× 3.

HORSENETTLE

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MILKWEED

Drawings courtesy of Agricultural Research Service, U.S. Department of Agriculture.

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Rhus radicans L. Poison ivy. *A*, Habit—× 0.5; *B*, flower panicle—× 0.5; *C*, flowers—× 4; *D*, drupe—× 2.5; *E*, stones—× 2.5; *F*, aerial roots—× 2.5

POISON IVY

Drawing courtesy of Agricultural Research Service, U.S. Department of Agriculture.